SYNTHETIC RESIN BOTTLE-TYPE CONTAINER

BACKGROUND ART

Technical Field

[0001] The present invention relates to a synthetic resin bottle-type container obtained by molding a synthetic resin, such as polyethylene terephthalate, by biaxial stretch blow molding, and aims at advantageously avoiding occurrence of deformations of the container, particularly deformations on its shoulder portion due to dislocation of pressure reduction absorbing panels.

Prior Art

[0002] Currently, synthetic resin containers represented by PET bottles are widely used as containers for storing beverages, seasonings, liquors, detergents, medicines, etc., because they are light in weight and easy to handle, they ensure transparency to provide a refined appearance comparable to glass containers, and they can be obtained at low cost.

[0003] Moreover, for this type of synthetic resin containers, improvements have been achieved in terms of the heat-resistance so that the containers can be directly filled with relatively hot contents immediately after high-temperature sterilization, without requiring a previous cooling thereof.

[0004] Particularly in the case of such containers with improved heat resistance, deformations of the container takes place inevitably, due to reduction of the internal pressure upon cooling of the contents to the room temperature. In order to minimize such deformations, the container body may be provided with at least one groove that is recessed inwards of the container, to thereby define the so-called pressure-reduction absorbing panels.

[0005] However, when the containers having the pressure-reduction absorbing panels, particularly the containers of a rectangular cross-section, are provided with the border of the panels close to the shoulder portion, a local indentation of the shoulder portion tend to take place along with the dislocation of the panels upon absorption of the pressure reduction. The containers with locally indented shoulder portion cannot be shipped as marketable products, and thus cause the yield to be lowered.

[0006] In the synthetic resin blow molded containers, the shoulder portion has a

relatively poor strength since, from the beginning, the wall at the shoulder portion tends to become thin, and the wall itself does not undergo a sufficient stretching as is the case with the container body portion. In this connection, there has been proposed a blow-molded container provided at its shoulder portion with a stepped portion, and the region extending from the stepped portion to the container body portion has a polyhedral shape as defined by triangular panels (see, for example, Japanese Patent Application Publication No. 06-127542). However, due to the progressive demand for the weight reduction of resin containers and a resultant reduced wall thickness at the shoulder portion, large-sized containers with a volume of as large as 1.5 l tend to be severely affected by the dislocation of the panels due to an increased absorption amount of the pressure reduction. Thus, a mere application of the conventional approach would not provide a sufficient solution.

DISCLOSURE OF THE INVENTION

[0007] It is an object of the present invention to provide a novel synthetic resin bottle-type container capable of preventing its shoulder portion from deformation due to dislocation of the pressure-reduction absorbing panels.

[0008] According to the present invention, there is provided a synthetic resin bottle-type container comprising a shoulder portion continuous with a mouth portion for pouring out contents, and a body portion forms a space for accommodating the contents over an area extending to its bottom wall from said shoulder portion;

said body portion comprising pressure-reduction absorbing panels defined by at least one groove that projects inwards of said container; and

said at least one groove comprising a groove for said pressure-reduction absorbing panel which is situated immediately below said shoulder portion, said groove being provided with a recess extending along said groove and having a depth larger than that of the groove.

[0009] It is preferred that the recess has a width which is substantially the same as that of said groove.

[0010] It is further preferred that the recess has a slope inclined from its outer surface toward a bottom of said groove, for preventing shrinkage.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The present invention will be described in detail below by means of preferred embodiments with reference to the accompanying drawings.

[0012] FIG. 1 illustrates a container according to one embodiment of the present invention.

[0013] FIGS. 2, 3 and 4 are side view, plan view and bottom view of the container, respectively.

[0014] FIGS. 5a, 5b and 5c are front view, longitudinal-sectional view and cross-sectional view of the pressure-reduction absorbing panel 5, respectively.

[0015] FIGS. 6a, 6b and 6c are front view, longitudinal-sectional view and cross-sectional view of another pressure-reduction absorbing panel 6, respectively.

[0016] FIGS. 7a, 7b and 7c are front view, longitudinal-sectional view and cross-sectional views of yet another pressure-reduction absorbing panel 7, respectively.

[0017] FIGS. 8a, 8b and 8c are front view, longitudinal-sectional view and cross-sectional views of yet another pressure-reduction absorbing panel 8, respectively.

[0018] FIG. 9 shows the overview of a control container.

[0019] FIG. 10 illustrates a container according to another embodiment of the invention.

BEST MODE FOR CARRYING OUT THE INVENTION

[0020] A waisted bottle-type container having a rectangular cross-section according to an embodiment of the invention is shown in FIGS. 1 to 4, wherein reference numeral 1 represents a mouth portion for pouring out the contents, 2 represents a shoulder portion that is continuous with the mouth portion, and 3 represents a body portion forming a space for filling the contents in its region from the shoulder portion 2 to the bottom wall of the container. The body portion 3 has a rectangular cross-section, and is integrally formed by a pair of long-side walls 3a placed opposite to each other, and a pair of short-side walls 3b similarly placed opposite to each other, and four corner walls 3c for connecting the adjoining walls 3a and 3b at the corners to enhance the buckling resistance of the container.

[0021] Reference numeral 4 represents a reinforcing waist portion which extends around the body portion 3 to divide it into upper and lower regions, 5 represents pressure-reduction absorbing panels formed in the upper part of the long-side walls 3a, 6 represents pressure-reduction absorbing panels formed in the lower part of the long-side walls 3a, 7 represents pressure-reduction absorbing panels formed in the

upper part of the short-side walls 3b, and 8 represents pressure-reduction absorbing panels formed in the lower part of the short-side walls 3b. These panels 5 to 8 have their profiles shown in FIGS. 5a, 5b, 5c to FIGS. 8a, 8b, 8c, respectively. As can be seen from these figures, each panel is defined by grooves M recessed toward the interior of the container so that, when the pressure within the container is reduced, the panels are deflected inwards to thereby prevent the container from deformation.

[0022] Reference numeral 9 represents a recess continuous with the uppermost groove M (i.e., the groove immediately below the shoulder portion) which defines the uppermost border of the pressure-reduction absorbing panel 5, wherein the depth "t" of the recess 9 is greater than that of the groove M (see Fig. 5b).

[0023] FIG. 9 illustrates a control container having the same rectangular cross-section as that of the container shown in FIGS. 1 to 4. Since this type of containers have a larger surface area in its sides containing long-side walls, the shoulder portion has an increased risk of developing local deformation due to the dislocation of the panels upon absorption of the internal pressure reduction. The occurrence of such local deformation causes the yield to be lowered. On the contrary, the container according to the present invention is provided with the recess 9 at the uppermost groove M of each pressure-reduction absorbing panel 5 and the recess 9 has a depth "t" greater than that of the groove M, to increase the local rigidity and thereby avoid a situation wherein the shoulder portion 2 readily undergoes deformation.

[0024] It is preferred that the width of recess 9 is made the same as that of the groove defining the pressure-reduction absorbing panel, in view of the moldability of the container.

[0025] The depth "t" and length of recess 9 may be varied as appropriate, provided that the size of the container and/or the function of the pressure-reduction absorbing panel are not affected.

[0026] FIG. 10 illustrates a container representing another embodiment of the invention.

[0027] When the recess 9 is formed by the blow molding of containers, there may be instances wherein shrinkage is developed in pillar walls 3c depending upon the depth "t" and width of the recess 9.

[0028] To cope with this problem, there is provided a downward slope S at each outer wall 9a of the recess 9 to extend towards the bottom of the recess so as to

prevent shrinkage during the blow molding.

[0029] 1.5 *l* containers according to the invention as shown in FIGS. 1 to 5 were prepared (the use amount of resin is 55g, the groove defining each pressure-reduction absorbing panel has a depth of 1.5 mm and width of 7mm, and the recess 9 has a depth of 4.5 mm and width of 7 mm), and 1.5 *l* control containers as shown in Fig. 9 were also prepared (the use amount of resin is 55g, and the groove defining each pressure-reduction absorbing panel has a depth of 1.5 mm and width of 7 mm). These two types of containers were subjected to internal pressure reduction to determine the critical strength to pressure reduction, or the pressure level at which noticeable deformation occurs due to pressure reduction.

[0030] As a result, whereas the control container shown in FIG. 9 had its shoulder portion deformed at 41 mmHg, the container according to the invention had its shoulder portion prevented from deformation until the pressure lowered down to 55 mmHg. Thus, it has been confirmed that the resistance to pressure reduction is remarkably improved in the container according to the invention, as compared to the control container.

[0031] It will be appreciated from the foregoing description that, according to the present invention, it is possible to reliably prevent the shoulder portions of the container from being deformed due to the absorption of the pressure reduction, and to thereby improve the production yield.

[0032] The present invention has been described with reference to the illustrated embodiments on the premise that the container has a rectangular cross-section. However, the present invention is not limited to containers having such a specific configuration, and can also be suitably applied to containers having a circular or polygonal cross-section. Similarly, the capacity of the container is not limited to any specific range, and the invention can also be suitably applied to containers having a capacity that ranges from a volume of as small as 200 *ml* or 300 *ml* to a volume larger than 1.5 *l*, provided that the container has pressure-reduction absorbing panels on its surfaces.